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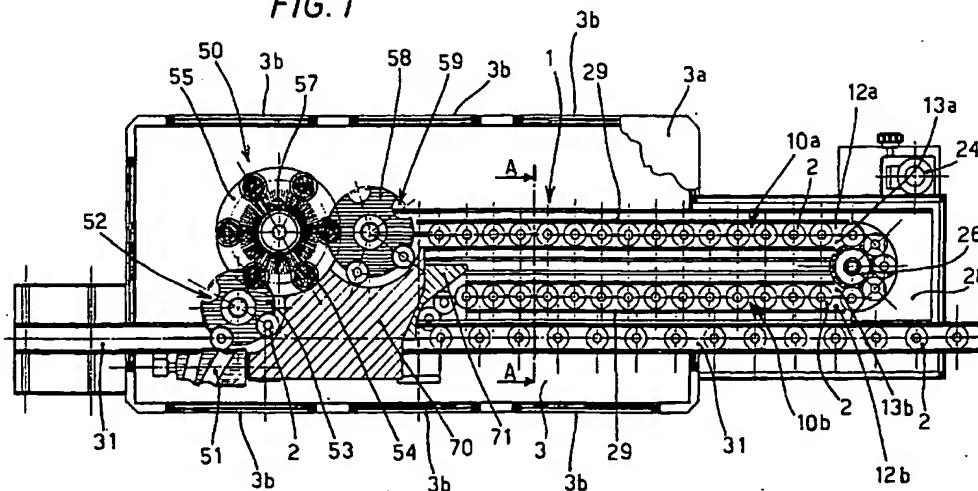
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(54) **An apparatus for drying bottles**

(57) An apparatus (1) is disclosed for drying bottles (2), comprising at least one line (10a, 10b) for conveying the standing bottles (2) through means (40) adapted to dry the bottle external surface, in which the bottle conveyor line (10a, 10b) comprises a pair of conveyor belts

(12a, 13a, 12b, 13b) parallelly disposed and advancing at different speeds on which the bases of said bottles (2) rest.

**FIG. 1**



## Description

[0001] The present invention refers to an apparatus for drying bottles, particularly of the type used in combination with a machine for washing bottles in a bottling plant.

[0002] The large bottling plants generally comprise a series of automated apparatuses performing the several operations of the bottling cycle, such as washing and drying the inside of the bottles, filling the bottles with a desired liquid, corking or capping the bottles, washing and drying the bottle outside, labelling and packaging the bottles.

[0003] According to a known technique, after the washing step the drying of the bottle external surface is generally performed by advancing the standing bottles along a conveyor belt through streams of forced air directed around the bottle external surface.

[0004] A problem associated with the drying step derives from the necessity to obtain a complete drying of the whole external surface of the bottle, without leaving areas that are not completely dried at the end of the drying step since moist areas could impair the success of the subsequent labelling step.

[0005] A first object of the present invention is therefore to provide an apparatus that allows the complete drying of the whole external surface of the bottles.

[0006] A further problem associated with the bottle drying step derives from the necessity to obtain a high drying speed to prevent undue delays in large bottling lines.

[0007] A second object of the present invention is therefore to provide an apparatus allowing to quickly dry a large number of bottles.

[0008] The above and other objects of the invention are accomplished through an apparatus for drying bottles as claimed in the attached claims.

[0009] The apparatus for drying bottles according to the invention accomplishes the advancing of the bottles to be dried through a conveying line comprising a pair of conveyor belts adjacent and parallel to each other advancing at different speeds, on which the standing bottles are carried, the bases of such bottles resting for half on one belt and for half on the adjacent belt.

[0010] Thanks to the different advancing speeds of the belts, a rotating motion is imparted to the bases of the bottles around their axes during the advancing motion. Still according to the invention, the bottles are made to advance through air streams ejected from ducts located sideways to the conveyor belts and inclined in a downwards direction with respect to the bottle translation. This way, thanks to the combination of the belt translation motion with the bottle rotary motion, the air stream licks up the whole bottle surface starting from the cork down to the bottle base producing a spiral drying effect.

[0011] Advantageously, according to the invention, the conveyor line is divided in two or more sections

located either parallel to each other or at different angles to reduce the longitudinal overall dimension of the apparatus.

[0012] The invention will be disclosed with greater detail with reference to the attached drawings, in which:

Figure 1 is a plan view of an apparatus according to the invention, located downwards of a station for washing the bottles;

Figure 2 is a side view of the apparatus shown in Figure 1;

Figure 3 is a sectional view along line A-A of Figure 1;

Figure 4 is a sectional view of a detail of the driving mechanism of the conveyor belts.

[0013] With reference to Figures 1 to 3, the apparatus 1 for drying bottles according to the invention is disposed on a substantially parallelepiped base 3, constituted by a box-shaped frame 3d and provided with a covering 3a, detachable side walls 3b and a plurality of adjustable supporting feet 3c. The apparatus 1 comprises a conveyor line 10a, 10b for feeding the bottles 2 to be dried through means 40 generating air streams, such means being located sideways to the conveyor line 10a, 10b.

[0014] According to a preferred embodiment of the invention, the conveyor line 10a, 10b comprises a first section 10a on which the bottles 2 to be dried are disposed, and a second section 10b from which the dried bottles 2 are withdrawn for being transferred to the next processing steps.

[0015] Of course the choice of a conveyor line divided into two sections is not to be considered as limiting since the apparatus of the invention could provide either a single section or a plurality of sections arranged in parallel or according to different directions as needed, without departing from the inventive concept.

[0016] Each conveyor line 10a, 10b comprises a pair of conveying belts, indicated in the Figures with the references 12a, 13a for the section 10a, and 12b, 13b for the section 10b, respectively, said belts being adjacent and parallel to each other, and supporting the bases of the bottles 2, with half of the base resting on a belt and the other half resting on the adjacent belt.

[0017] According to the present invention, the conveyor belts 12a, 12b of the conveyor line 10a, 10b advance at a speed different from the speed of the belts conveyors 13a, 13b. This way, during the advancing movement of the belts, a rotating motion around their axes is imparted to the bottles 2.

[0018] By properly adjusting the mutual speeds of the belts 12a, 12b and 13a, 13b it is possible to impart to the bottles 2 a desired advancing speed as well as a number of rotations (turns) suitable to ensure a complete drying of the bottles 2.

[0019] Moreover, according to a preferred embodiment of the invention, the conveyor belts 12a, 12b and

13a, 13b are slightly inclined towards the centre line of the conveyor line so that the transversal cross section of the conveying surface on which the bottles 2 rest has a V-shaped configuration.

[0020] Thanks to the different speed of the conveyor belts and to the particular V configuration of the carrying plane a constant rotation of the bottles 2 around their axes is ensured and the distances between the bottles 2 are kept constant during the drying step.

[0021] The conveyor belts 12a, 12b and 13a, 13b are preferably realized through meshes of a resistant and inextensible plastic material, running over supports 11a, 11b, preferably of box-type stainless steel members, on which spacers 17 and 18 of a material having a low coefficient of friction are applied for an easier sliding of the belts.

[0022] According to the invention, said spacers 17 and 18 are realized in such a way that the belts 12a, 12b and 13a, 13b are inclined towards the centerline, as shown in Figure 3 by an angle  $\alpha$  preferably comprised between about 1° and 5°.

[0023] Figure 4 shows a cross section of the driving mechanism of the conveyor belts 12a, 12b and 13a, 13b, this mechanism also providing the different advancing speeds to the belts 12a, 12b and 13a, 13b. The drive mechanism comprises a shaft 20, protruding from a gearmotor 24 (shown in Figure 1), on which a first gear 21 is mounted, engaging with its outer teeth 21a the meshes of the faster conveyor belt 12a, 12b.

[0024] The free end of the shaft 20, provided with teeth 20a engages the internal teeth 22b of a second (annular) gear 22 the diameter of which is smaller than that of the gear 21. The gear 21 in turn is keyed to a idle shaft 23 rotatably supported on a (not illustrated) support.

[0025] Alternatively, the shaft 23 can be fastened to such support and the gear 22 can be rotatably supported on the shaft 23 through a bushing or a ball bearing.

[0026] The gear 22 is further provided with external teeth 22a engaging the meshes of the slower belt 13a, 13b, substantially laying in the same plane of the faster belt 12a, 12b.

[0027] In this respect the tolerance of the mesh openings 14 in belts 12a, 12b and 13a, 13b is large enough to allow the engagement thereof with the teeth 21a (respectively 22a) of the gear 21 (respectively 22) also when the conveyor belts 12a, 12b and 13a, 13b are in a position inclined with respect to the rotation axis of said gears 21, 22.

[0028] In the illustrated embodiment of the present invention, a first driving mechanism of the type described with reference to Figure 4 is provided for driving the belts 12a, 13a of the section 10a of the conveyor line, while a second similar mechanism is provided for driving the belts 12b, 13b of the section 10b of the conveyor line.

[0029] Both driving mechanisms can be actuated

by means of corresponding electric motors (not shown), synchronized to each other through known means, for instance a speedometer dynamo.

[0030] Again with reference to Figure 1, the apparatus according to the present invention further comprises a motor-driven rotatable disk 26, preferably of a spongy material, located in correspondence of a semicircular wall 28, adapted to transfer the bottles 2 from the section 10a to the section 10b of the conveyor line 10a, 10b along a semicircular path defined by the contour of said wall 28.

[0031] Preferably the means 40 for generating the drying air streams can comprise pairs of ducts 41 hanging from the base covering 3a through brackets 42 and disposed sideways of the conveyor line 10a, 10b.

[0032] Such ducts 41 are suitably inclined to the conveying surface along the conveyor line 10a, 10b so as to produce air streams at different heights along said conveyor line 10a, 10b.

[0033] Preferably, said ducts 41 are disposed tilted downwards along the bottles' advancing direction, in the first section 10a starting from a height corresponding to the cork or cap 2a applied to the bottle down to a point located at half of the bottle height, and in the second section 10b extending from a point slightly higher than half the height of the bottles 2 down to the base of the bottles 2.

[0034] Advantageously, said air flows are obtained through a plurality of holes 43 provided along each duct 41 and directing the air towards the bottles transit zone, as illustrated in Figure 3, so as to generate a laminar flow of air that perpendicularly licks the external surface of the bottles 2.

[0035] A bottle 2 advancing along the conveyor line 10a, 10b, is thus subjected to a spiral drying action, moving top-down that drags downward the film of water covering the bottles 2 and ensures a complete drying of the whole external surface of the bottles 2.

[0036] For producing a flow of forced air inside the ducts 41, a pair of fans 44 is located on the covering 3a of the base 3, and each fan is connected by a hose 45 to a hub 46 connected to the upper end of each duct 41.

[0037] Figures 1 and 2 illustrate a washing station 50 located upwards of the apparatus 1 according to the invention. The washing station 50 comprises a screw or worm conveyor 51 for picking up each bottle 2 from a belt conveyor 31 and inserting it into a semicircular socket 52 of a first revolving circular distributor 53.

[0038] The first distributor 53 transfer the bottles 2 onto one rotatable base 54 of a plurality of rotatable bases provided on a rotatable circular carousel 55. After being deposited onto the rotating bases 54 the bottles 2 are blocked by pressing caps 56 located on the upper part of the carousel 55, at the control unit 60 of said rotating carousel 55.

[0039] At the center of the rotating carousel 55 a brush 57 is mounted, rotating in the opposite direction with respect to the rotating bases 54 and to the carousel

55, for washing of the external surface of the bottles 2 through water jets from nozzles 61 laterally disposed with respect to the carousel 55.

[0040] A second rotating circular distributor 58, of the same type of distributor 53 and equipped with semicircular sockets 59, picks up the bottles 2 from the carousel 55 and transfers them onto the first section 10a of the conveyor line 10a, 10b of the apparatus for drying bottles.

[0041] A wail 70, properly shaped with curved profiles corresponding to the curvatures of the distributors 53 and 58 and of the carousel 55, is provided for maintaining the bottles 2 inside the semicircular sockets 52 and 59 during the transfer of the bottles 2 from the belt 31 to the rotating carousel 55 and from the rotating carousel 55 to the first section 10a of the conveyor line 10a, 10b.

[0042] According to the invention, after being subjected to the drying step, through a special tapered portion 71 the bottles 2 are transferred again from the second section 10b of the conveyor line 10a, 10b to the belt conveyor 31 from which they will be picked up for the subsequent processing steps.

[0043] It is further provided a support 32, fixed to the base 3 through a box-type member 33, for supporting said belt conveyor 31 parallelly to the conveyor line 10a, 10b.

[0044] As better illustrated in Figure 3, there are further provided guides 29 that can be adjusted both in height and horizontally through corresponding handle grips 30; moreover such guides are parallel to the conveyor line 10a, 10b and to the belt conveyor 31 so as to keep the bottles 2 on the corresponding conveyor belts during the translation along the conveyor line and along the belt 31.

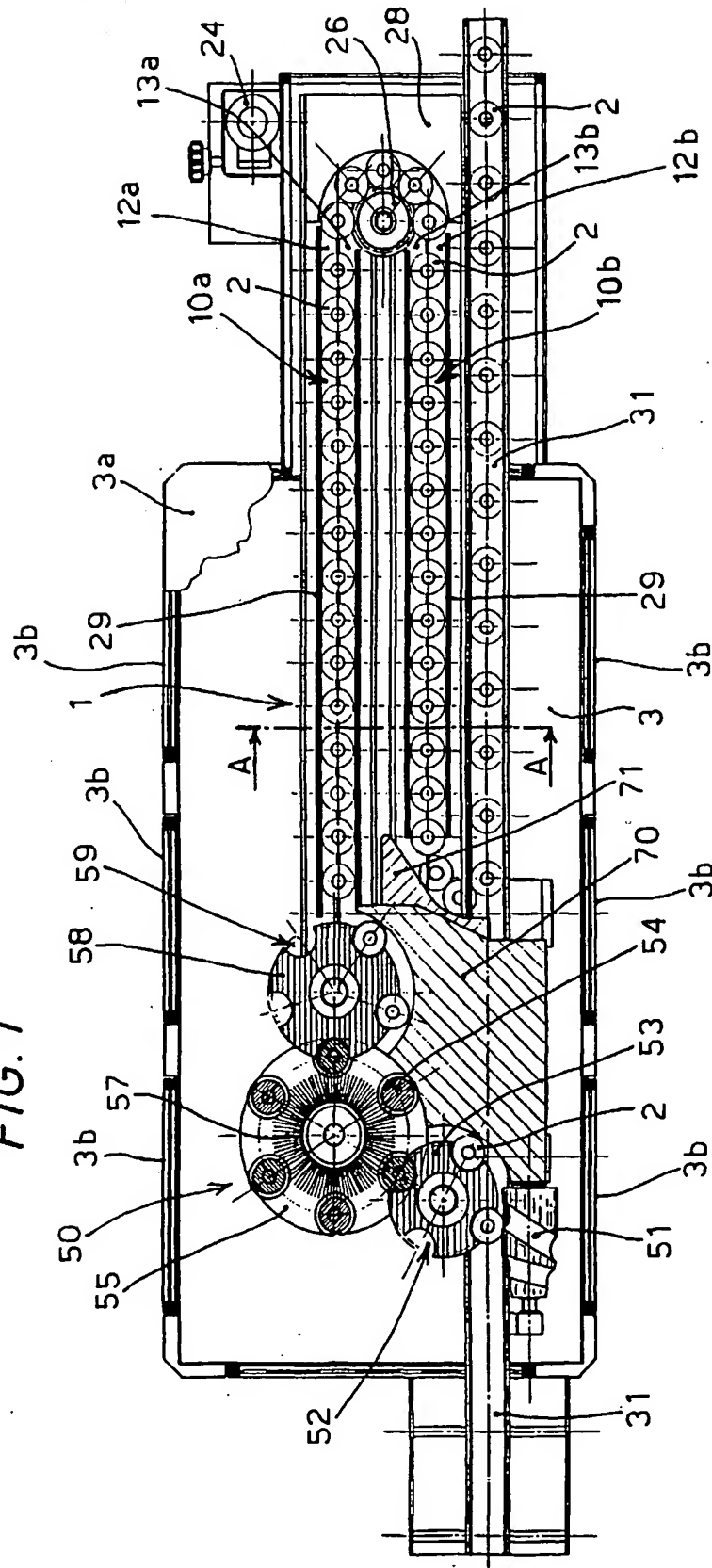
#### Claims

1. An apparatus (1) for drying bottles (2) comprising at least one conveyor line (10a, 10b) for advancing said bottles (2) through drying means (40), characterized in that said at least one conveyor line (10a, 10b) comprises a pair of conveyor belts (12a, 13a, 12b, 13b) on which said bottles (2) rest, said belts being disposed parallel to each other and advancing at different speeds.
2. A drying apparatus as claimed in claim 1, characterized in that said belts (12a, 13a, 12b, 13b) advance in the same direction.
3. A drying apparatus as claimed in claim 1 or 2, characterized in that said belts (12a, 13a, 12b, 13b) are inclined towards the center line of the conveyor line (10a, 10b) so as to define a carrying surface having a substantially V-Shaped transversal cross section.
4. A drying apparatus according to any of the preced-

ing claims, characterized in that said conveyor line comprises a first section (10a) for transferring the bottles (2) along a first direction, and a second section (10b) for transferring the bottles (2) along a second direction.

5. A drying apparatus as claimed in claim 4, characterized by providing means for transferring said bottles (2) from said first section (10a) to said second section (10b) of said conveyor line, said means comprising a motor driven rotating disk (26), preferably of a spongy material, and a shaped wall (28) defining the path of the bottles.
6. A drying apparatus (1) as claimed in any of the preceding claims, characterized in that said drying means (40) comprises pairs of ducts (41) for generating flows of forced air that are located transversely to said conveyor line (10a, 10b) and inclined downwards along the advancing direction of the bottles (2).
7. A drying apparatus (1) as claimed in claim 6, characterized in that said ducts (41) are equipped with a plurality of holes (43) for ejecting air.
8. A drying apparatus (1) as claimed in claim 1, characterized in that said different belt speeds are obtained through a drive mechanism comprising a shaft (20), a first gear (21) keyed to said shaft (20) and provided with outer teeth (21a) engaging the faster belt, and a second gear (22) of smaller size than said first gear (21), said second gear (22) being provided with outer teeth (22b) and engaging the slower belt and with inner teeth (22a) meshing with teeth (20a) formed at the end of said shaft (20).
9. A drying apparatus (1) as claimed in claim 8, characterized in that said belts (12a, 13a, 12b, 13b) comprise meshes of a resistant plastic material and inextensible, with a mesh opening (14) large enough to allow the engagement of the teeth (21a, 22a) also when the belts (12a, 13a, 12b, 13b) are inclined.
10. A drying apparatus (1) as claimed in any of the preceding claims, characterized in that it further comprises, upwards of said conveyor line (10a, 10b), a washing station (50) for washing the external surface of the bottles (2).

FIG. 1



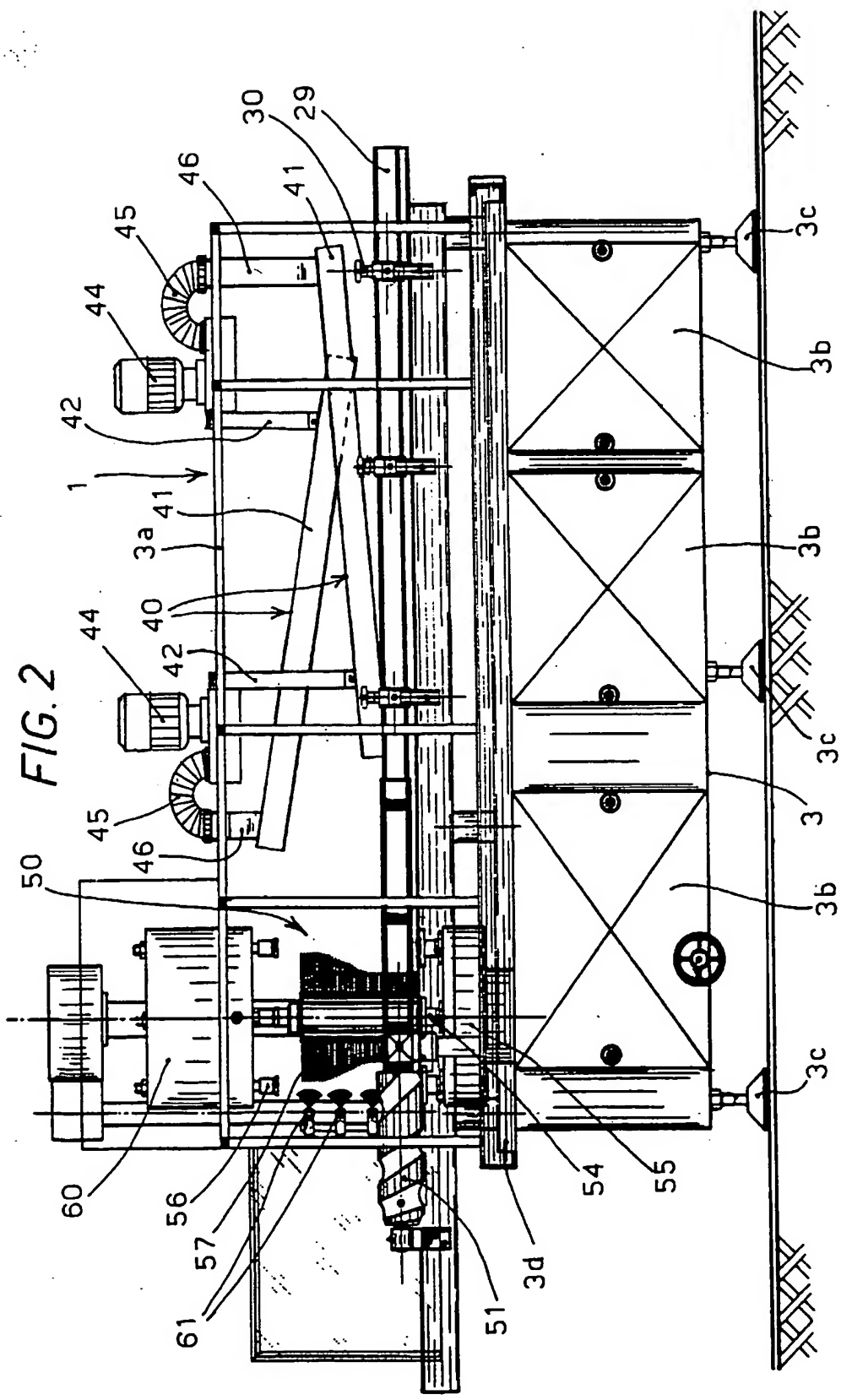
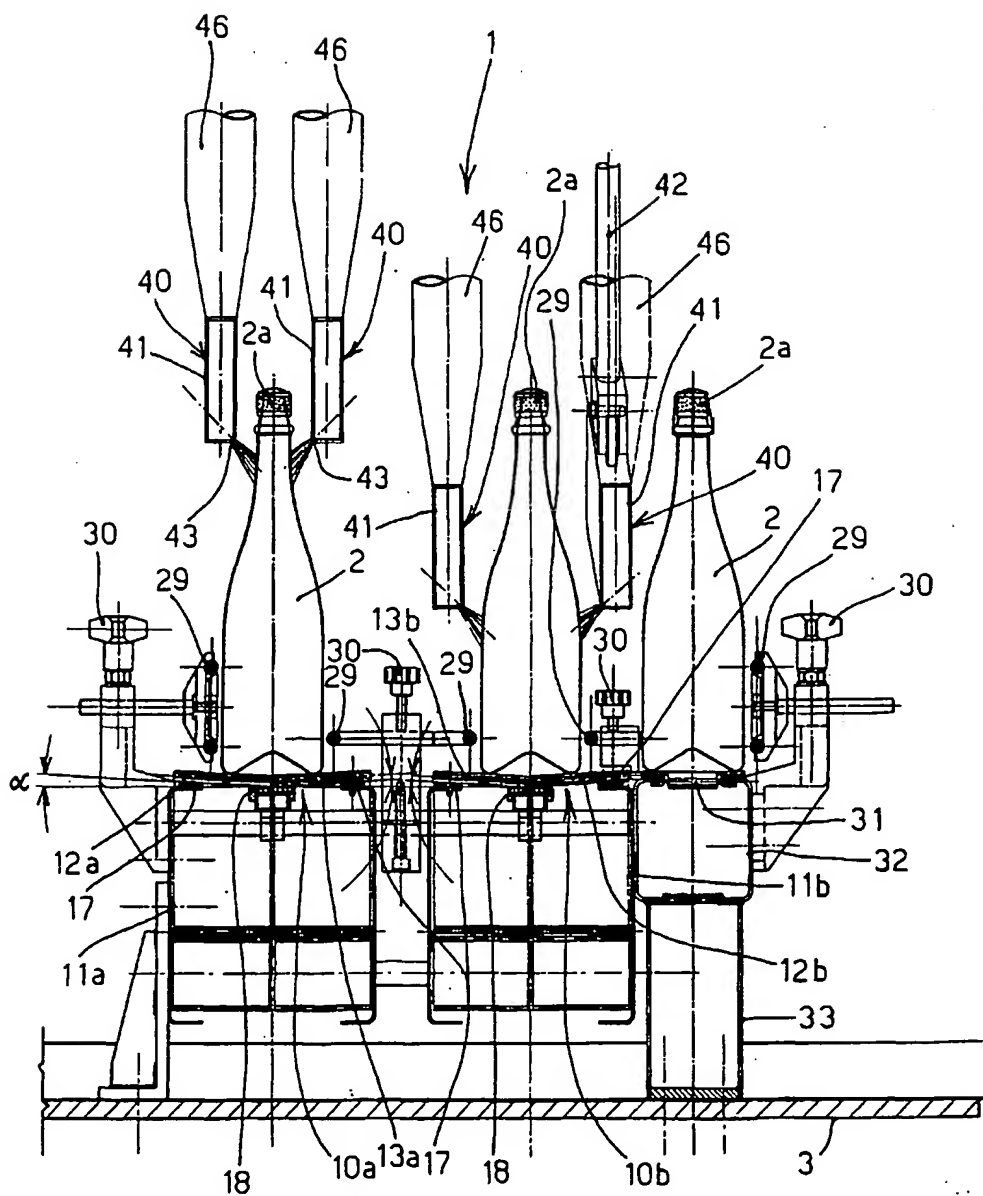


FIG. 3



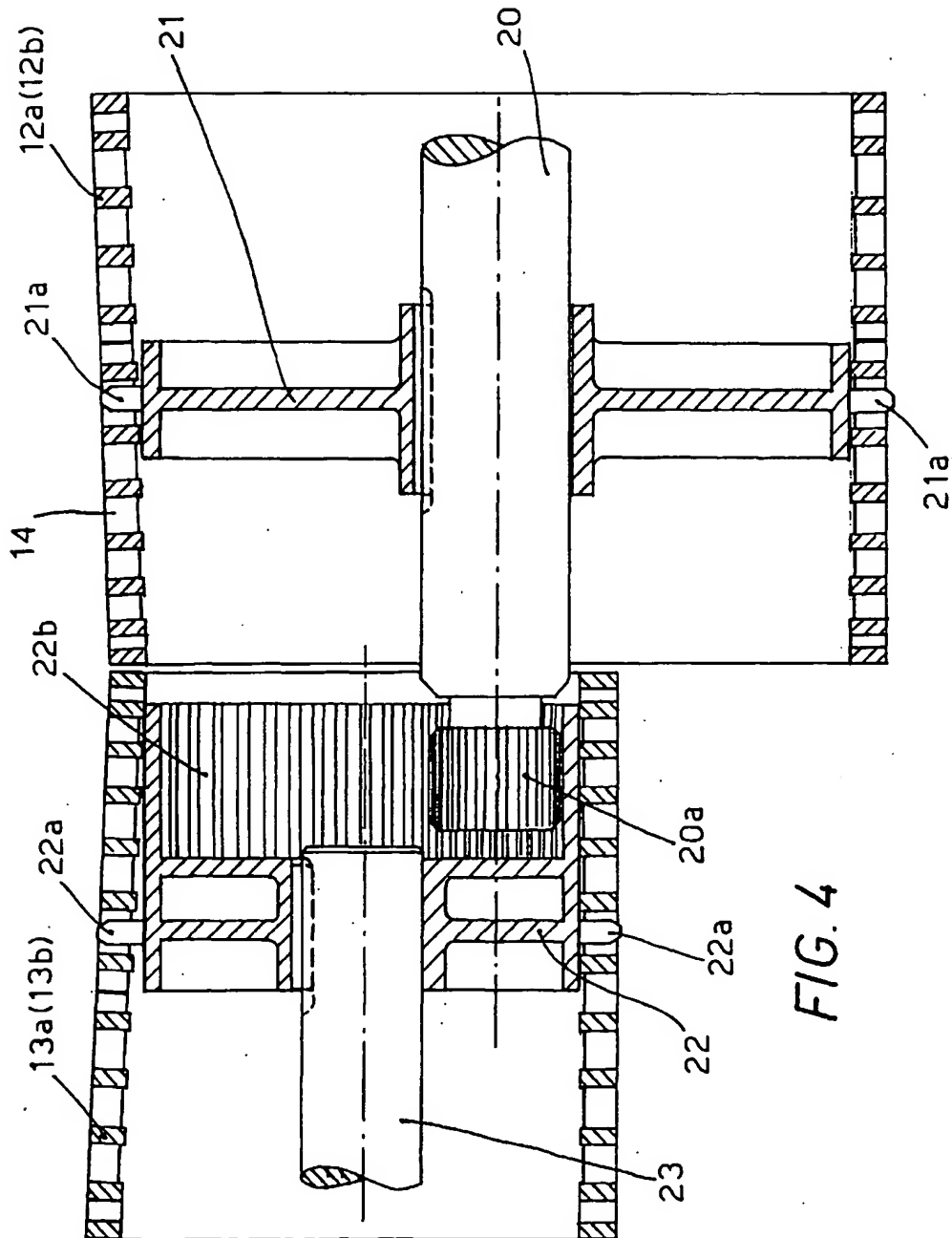


FIG. 4





European Patent  
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Application Number  
EP 99 83 0067

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Place of search <b>THE HAGUE</b>		Date of completion of the search <b>23 June 1999</b>	Examiner <b>Silvis, H</b>
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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